

the last mentioned from Mexico, the other two from Rio Janeiro. *C. Schmidtii*\* of French collections (Brazil) from the very slight, if any, narrowing of the thorax near the base, seems to stand on the confines of subsections *a* and *b*.

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XXVI.—*On the Nomenclature of the Foraminifera.* By MESSRS. W. K. PARKER, F.Z.S., T. R. JONES, F.G.S., and H. B. BRADY, F.L.S., F.G.S.

Part XI.—*The Species enumerated by Batsch in 1791.*

IN order of priority the Foraminifera described and figured by Batsch should have been noticed next to those enumerated by Linnæus and Gmelin; but we had then had no opportunity of seeing his book, or otherwise of identifying the species named by him. The work, a copy of which we have been fortunate enough to secure, appears to be scarce, and consists mainly of a series of six beautiful and characteristic quarto copper-plates of minute sea-shells. The letterpress is confined to four quarto pages, one of which is occupied by the title. We propose to give a translation of the descriptions of the species, and to append to each such observations as appear necessary. Unlike the drawings given by nearly all the other earlier naturalists, those in Batsch's work leave no room for doubt as to the species for which they are intended; the specimens have been so carefully selected, and the figures are so beautifully drawn and so well engraved, that identification becomes an easy process. In addition to this, our author shows great judgment in putting together the varietal forms of the *Nodosaria* group, distinguishing them from the porcellanous-shelled *Peneroplides*. The whole of the figures are of Foraminifera (sixteen "*species*"); and of each form several drawings are given, together with minute outlines of the natural size. It is greatly to be regretted that we have no record of the locality whence the material containing the specimens figured was obtained, as one at least of the varietal forms of *Nodosaria* (No. III., *N. murex*) has not, so far as we know, been noticed by subsequent observers.

\* *C. Schmidtii*. Elongata, postice attenuata. Caput obscure, vertice cinereo macula trigona nigra. Antennæ nigrae, articulis basi griseis. Thorax ante basin tuberculo parvo, deinde vix angustatus; dorso griseus, vittis quinque nigris, mediana latiore lineolam griseam includente. Elytra grisea, nigro punctata, maculis confluentibus ochraceo-cinereis conspersa, maculis majoribus vel fasciis tribus nigris, una (interdum obsoleta) ante medium, altera majore angulata pone medium, tertiaque prope apicem; apicibus sinuato-truncatis, angulis suturalibus prominulis, exterioribus productis. Pedes picei, cinereo annulati. Fœminæ segmentum ultimum dorsale attenuatum bifidum; maris emarginatum. Long.  $7\frac{1}{2}$  lin. ♂ ♀. *Hab.* in Rio Janeiro, a Rev. Hamlet Clark lecta.

The work is entitled 'Sechs Kupfertafeln mit Conchylien des Seesandes, gezeichnet und gestochen von A. J. G. C. Batsch. Pränumerations-Preis, schwarz, 12 gr., illuminirt 1 Rthlr. Jena, in Commission der academischen Buchhandlung, 1791.' There is no preface to the work, a short note, of which the following is a translation, serving as introduction; after this, a simple description of the species to which each figure is referred is given. In addition to the Latin generic and specific names, each form has a vernacular designation appended, which is mostly a translation of the Latin into German.

(Translation.) "A short description of the plates, which are of many-chambered shells, either quite straight or partially curved."

I. *Nautilus (Orthoceras) costatus*. The Ribbed Sea-staff. Pl. 1. fig. 1 a-1 g. [*Nodosarina (Marginulina) Raphanus*, Linn. sp.]

(Trans.) "The chambers or joints are round, bullet-shaped, and separated from one another, and are bound by strong ribs, which extend without interruption over the whole of the shell, and have for the most part smooth edges. The forms differ both in contour and colour, which here, less than in other natural objects, determine the general character. Fig. 1 is ground down to show the construction of the interior. In Plates 1 and 2 the small horizontal lines show the natural sizes."

Seven figures in all are given of this form, one of them being evidently a careful representation of a shell with a portion of the surface ground off, so as to show the interior. They represent the strongly ribbed and frequently Marginuline form of *Nodosarina*, to which the specific name *Raphanus* had previously been given by Linnæus. Amongst the specimens here figured there is a varying degree of obliquity of growth in the earlier chambers, and excentricity of terminal aperture. Whilst the figures generally are *Marginulina*, fig. 1 a is only removed from *Nodosaria* by its *slightly* excentric aperture; and the fragment fig. 1 e is a true *Nodosaria* without any Marginuline curvature.

II. *Nautilus (O.) comatus*. The Haired Sea-staff. Pl. 1. figs. 2 a-2 d. [Figs. 2 a, 2 b. *Nodosaria comata*, Batsch; figs. 2 c, 2 d. *Glandulina glans*, D'Orb.]

(Trans.) "The cylindrical joints run more together, and the whole is covered with riblets, which are continuous, except over the end portions of the terminal chamber. Probably fig. 7 b (on plate 3) is simply a variety. Both specimens are ground away."

The figures referred to belong to two somewhat different varietal forms of *Nodosarina*. Figs. 2 a and 2 b represent a smallish specimen of *Nodosaria Raphanus* (the earliest chamber



imperfect), in which delicate riblets take the place of costæ as ornamentation. These riblets do not run the entire length of the shell, and become, on the large terminal chamber, fine hair-like markings. The chambers are also less separated at the sutures than in *N. Raphanus*. Figs. 2 *c* and 2 *d* represent the one an outside view, the other a section, of a shortened, more conical form of *Nodosarina*, with a similar striate or hairy ornament running over it. Both contour and surface-marking are accurately given in D'Orbigny's 'Modèle' No. 51 (*Nodosaria (Glandulina) glans*).

III. *Nautilus (O.) Murex*. The Warty Sea-staff. Pl. 2. figs. 3 *a*, 3 *b*.  
[*Nodosaria Murex*, Batsch.]

(*Trans.*) "The chambers are round and bullet-shaped, covered with warts, and separated by smooth belts. The specimen ground down is curved."

So far as we know, this peculiar form has not been figured by any other author, neither have we ever seen specimens of the shell, though we have no reason to doubt the existence of such a variety.

IV. *Nautilus (O.) scalaris*. The Yoked Sea-staff. Pl. 2. figs. 4 *a*, *b*.  
[*Nodosaria scalaris*, Batsch.]

(*Trans.*) "The round, bullet-shaped chambers are provided with delicate ribs, running perpendicularly and joining where the chambers meet."

D'Orbigny subsequently figured the same form as *Nodosaria longicauda*. The figure in Professor Williamson's Monograph (Rec. For. Gt. Br. pl. 2. fig. 38), where it is given as *N. radícula*, Mont., might almost have been taken from the same specimen as that drawn by our author.

V. *Nautilus (O.) obliquatus*. The Slant-grooved Sea-staff.  
Pl. 2. figs. 5 *a*-5 *d*. [*Nodosaria obliquata*, Batsch.]

(*Trans.*) "This very much elongated shell has longish chambers, which run almost into one another; and it is provided with string-like ribs, which run in a not quite straight direction down the shell."

Figures 5 *a*, *b*, & *d* show an even-margined, straight Nodosarian, with oblique parallel ribs. Figure 5 *c* is a portion of a somewhat curved specimen with similar ornamentation, showing, by its association with the other, a correct appreciation of the valuelessness of mere curvature as a specific character. The same form has been figured by Reuss (*Zeitschr. Deutsch. Geol. Gesel.* vol. iii. pl. 3. fig. 12) as *Dentalina obliquestriata*.

VI. *Nautilus (O.) vertebralis*. The Vertebral Sea-staff. Pl. 2.  
figs. 6 *a*, 6 *b*. [*Nodosaria Fascia*, Linn.]

(*Trans.*) "A prolonged almost unjointed shell, which has a few

continuous somewhat waved ribs. The partition-walls are broad and transparent."

These are interesting figures of one of the thick-ribbed limbate *Nodosaria*, several varieties of which are found in the Adriatic. The distinction between the first, or essential, shell and the thickened, or supplemental, portions is carefully rendered. All the straight forms with longitudinal costæ and broad transverse bands of clear shell-substance may be included under Linné's *Nodosaria Fascia*. (For further remarks on these, see Ann. & Mag. Nat. Hist. ser. 3. vol. xii. pp. 432, 433.)

VII. *Nautilus (O.) vaginaformis*. The Sheath-shaped Sea-staff. Pl. 3. figs. 7 *a*-7 *d*. [Fig. 7 *a*. *Lingulina carinata*, D'Orb.; fig. 7 *b*, either *Lingulina* or *Glandulina*, longitudinal section; fig. 7 *c*, *d*. *Marginulina*, sp. ?]

(*Trans.*) "The shell is broad and flat, with scarcely separated chambers, the broad and blunt under surfaces\* of which reach far into succeeding chambers."

This is a mixed group of somewhat indefinite forms, and we do not see that it ought to affect the nomenclature of already well-recognized subtypical species, whilst such uncertainty exists. Although the drawings are made with the same care as the others, we cannot recognize in fig. 7 *c*, or the sectional diagram, fig. 7 *d*, any form of *Marginulina* with which we are familiar. It appears as though it might have a rough or subarenaceous shell. We shall run the least risk of error or confusion in leaving these figures without further comment.

VIII. *Nautilus (O.) leguminiiformis*. The Pod-shaped Sea-staff. Pl. 3. figs. 8 *a*, 8 *b*. [Fig. 8 *a*. *Vaginulina leguminiiformis*, Batsch; fig. 8 *b*. *Dentalina communis*, D'Orb.]

(*Trans.*) "The smooth, almost coincident joints of this elongated shell are nearly cylindrical, and fit into each other like sheaths."

Fig. 8 *a* does not so well answer to the description given as the succeeding figure (8 *b*), it being one of the flattened or Vaginuline group of *Dentalinæ*, a form given by D'Orbigny, in his 'Voyage dans l'Amér. Mérid.' as *Marginulina Webbiana* (pl. 5. fig. 17). The trivial name *leguminiiformis*, however, will take precedence of that given by D'Orbigny. Fig. 8 *b* is the subcylindrical tapering form known as *Dentalina communis*, D'Orb.

IX. *Nautilus (O.) globifer*. The Button-bearing Sea-staff.

Pl. 3. figs. 9 *a*-9 *c*. [*Nodosaria globifera*, Batsch.]

(*Trans.*) "The chambers are elongated and somewhat distinct; only

\* The upper ends or stolon-passages.

the last [properly the first], the lowest in the drawing, is bullet-shaped. At the top it is button-shaped."

This is a straight *Nodosaria*, with much-elongated egg-shaped chambers. Setting aside the fact of the first chamber in two of the specimens figured being somewhat globular (whence Batsch's appellation), as a matter of little moment, they accurately represent the form figured by Soldani (*Testac. ac Zooph.* vol. iv. pl. 10. figs. H-M), and named by D'Orbigny *Nodosaria ovicula* (*Ann. des Sc. Nat.* vol. vii. p. 252).

X. *Nautilus* (O.) *Radicula*. The Knotted Sea-staff. Pl. 3. figs. 10 a, 10 b. [*Nodosaria limbata*, D'Orb.]

(*Trans.*) "The chambers are bullet-shaped, very distinct, and unusually strong."

The figures given are of the round-chambered, clear-shelled *Nodosaria*, free from surface-ornamentation, excepting belts of clear shell-substance at the union of the chambers. The same form is figured by D'Orbigny (*Craie blanche du Bassin de Paris*, pl. 1. fig. 1) under the name of *Nodosaria limbata*; and members of the group of which this may be considered the best central form have received many names at the hands of other authors. The specific name *radicula* had previously been employed by Linnæus for another and distinct form of *Nodosaria*; so that it is not admissible in the present case.

XI. *Nautilus* (O.) *conico-articulatus*. The Cone-chambered Sea-staff. Pl. 3. fig. 11. [*Articulina conico-articulata*, Batsch.]

(*Trans.*) "The chambers are shaped like inverted cones, and the walls are folded into oblique furrows. It was quite impossible to grind away this shell, as it was too brittle."

The feeble forms of *Vertebralina*, taking a much-elongated, narrow, subcylindrical contour, received from D'Orbigny the generic name *Articulina*. Though only embracing varieties of the type *Vertebralina striata*, we may, as a matter of convenience, keep the term. Fig. 11 represents the form indicated in the 'Modèles' (No. 22), and there named *Articulina nitida*.

XII. *Nautilus* (O.) *margaritiferus*. The Pearl-bearing Sea-staff. Pl. IV. figs. 12 a-12 c. [*Vaginulina margaritifera*, Batsch.]

(*Trans.*) "This strong, elongated, and almost unjointed shell is flattened, and has two sharp edges, and has in the middle high and projecting partition-walls, the feeble continuations of which can be seen at one edge."

A bold thick-shelled *Vaginulina*, with transverse ribs of clear shell-substance overlying the partition-walls between the chambers. A similar, but still more limbate, form has been named by D'Orbigny y *Vaginulina elegans* Modèles, No. 54).



XIII. *Nautilus (O.) Pennatula*. The Sea-feather Sea-staff. Pl. 4. figs. 13 *a*–13 *c*. [*Grammostomum Pennatula*, Batsch.]

(*Trans.*) “The partition-walls, which at the beginning of its growth are strangely crowded together, make at the upper\* end of the shell an altered feather-like portion. Figure *e* represents one of these parts alone.”

We have here five beautiful figures of the wide, flat Textularian form which commonly becomes uniserial in its mature growth. The subgeneric term *Grammostomum* is employed for this group. D’Orbigny (Modèles, No. 59) represents the same varietal form under the name *Vulvulina capreolus*.

XIV. *Nautilus (O.) Harpa*. The Harp-shaped Flat Sea-staff. Pl. 5. figs. 14 *a*–14 *e*. [Fig. 14 *a*. *Frondicularia complanata*, Defrance (fragment); fig. 14 *b, c*. *Flabellina Harpa*, Batsch; fig. 14 *d, e*. *Planularia Auris*, Fichtel & Moll.]

(*Trans.*) “The shell is quite flat, bright, and smooth. The partition-walls run obliquely, are parallel, and shine through the otherwise opaque shell. In this and in figure 13 may be clearly seen how little nature has made the evident character depend upon either form or colour.”

The five fine drawings on this plate are a somewhat mixed lot of closely allied forms. It would scarcely be right to supplant Defrance’s name for the subtypical *Frondicularia* on the authority of a figure of a fragment of shell confused with other specimens. Figs. *b* and *c* constitute the first notice we have of the Flabelline character of growth; and Batsch’s trivial name falls naturally into its place for the smooth partially costate forms. The other two figures represent *Planularia Auris*, F. & M.

XV. *Nautilus (Lituus) arietinus*. The Ram’s-horn Bishop-staff. Pl. 6. figs. 15 *a*–15 *f*. [Fig. 15 *a, b*. *Peneroplis pertusus*, Forskål; fig. 15 *c*. *Peneroplis pertusus*, var. *arietinus*, Batsch; fig. 15 *d, e, f*. *Spirolina Hemprichii*, Ehrenberg.]

(*Trans.*) “In all the different forms two characters remain quite evident, namely, the strong shell and its numerous folds or wrinkles. It is also much coiled.”

The varieties of *Peneroplis* of which this plate consists are, with much judgment, separated generically from the forms preceding them, which, as we have shown, belong almost entirely to the Nodosarian group. The term *Lituus* used by our author had previously been employed by Gmelin as a specific name for one of the varieties of the genus; consequently it cannot be brought forward to displace the well-known and convenient generic appellation originated by Montfort, *Peneroplis*.

\* Really the lower or first-formed portion.

These six figures, associated by Batsch as one species, together with the two which follow (16 *a*, 16 *b*), are varieties of the type *Peneroplis pertusus*, differing amongst themselves chiefly in the comparative length and breadth of the chambers and the extent to which they are coiled. Whilst insisting on the specific unity of the whole of the variations of form to which the type is subject, it is, zoologically, a convenience to recognize certain intermediate stages as constituting varieties worthy of distinct name. Thus the extremely dilated, flat, bonnet-shaped condition takes the subspecific name *P. planatus*, F. & M.; the moderately dilate, central-typical form is *P. pertusus*, Forskål; and one of the figures now under notice (15 *c*) might worthily take its place as a variety, with Batsch's name *P. arietinus*. In figs. *a*, *b*, and *c* the shape of the shell is determined by the excessively wide, flat development of the later chambers. In figs. *d*, *e*, and *f* the tendency is somewhat different, the later chambers leaving the nautiloid portion in a straight cylindrical line; and this tendency reaches its fullest development in the last two figures on the plate (16 *a*, *b*). These "Spiroline" forms were recognized by Lamarck and others, but confused with isomorphous varieties of *Valvulina* and *Lituola*; removing these, however, the long crozier-like *Peneroplides* may retain the term *Spirolina* (used subgenerically, for the sake of convenience only, not zoologically). The term *Coscinospira* was adopted by Ehrenberg for a short, stoutish, Lituuate or Spiroline form, such a one as figs. 15 *d*, *e*, *f*.

The wide variation in character presented by specimens of the type now under notice has caused much confusion in the nomenclature; and it will not be out of place here to point out some of the forms of *Peneroplis* referred to and named by the earlier writers, together with the view we take of their value.

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|---|-------------------------------------|
| 1775. <i>Nautilus pertusus</i> , Forskål, = <i>Peneroplis pertusus</i> , Forsk. Type*.              | } Varieties of <i>P. pertusus</i> . |
| 1781. <i>Nautilus rectus</i> , Spengler, = a mixed lot ( <i>Peneroplis</i> and <i>Articulina</i> ). |                                     |
| 1788. <i>Nautilus Lituus</i> , Gmelin, = <i>Peneroplis (Spirolina) Lituus</i> , Gm.                 |                                     |
| 1791. <i>Nautilus (Lituus) arietinus</i> , Batsch, = <i>Peneroplis arietinus</i> .                  |                                     |
| 1791. <i>Nautilus (Lituus) acicularis</i> , Batsch, = <i>Peneroplis (Spirolina) Lituus</i> (Gm.).   |                                     |
| 1803. <i>Nautilus planatus</i> , Fichtel & Moll, = <i>Peneroplis planatus</i> , F. & M.             |                                     |
| 1804. <i>Spirolina depressa</i> , Lamarck, = <i>Peneroplis pertusus</i> , Forsk.                    |                                     |
| 1804. <i>Spirolina cylindracea</i> , Lamarck, = <i>Peneroplis (Spirolina) Lituus</i> , Gm.          |                                     |
| 1808. <i>Peneroplis lanatus</i> , Montfort, = <i>Peneroplis planatus</i> , F. & M.                  |                                     |
| 1826. <i>Dendritina arbuscula</i> , D'Orbigny, = <i>Peneroplis (Dendritina) arbuscula</i> , D'Orb.  |                                     |
| 1839. <i>Coscinospira Hemprichii</i> , Ehrenberg, = <i>Peneroplis (Spirolina) Hemprichii</i> , Ehr. |                                     |

\* See Ann. Nat. Hist. ser. 3. vol. viii. p. 235. Forskål describes this species, and recognizes its marked variation of form, in 'Descript. Anim.'